

RODALE
ORGANIC GARDENING
BOOKS

GOOD BUG, BAD BUG

YOUR TAKE-ALONG
INSECT IDENTIFICATION GUIDE



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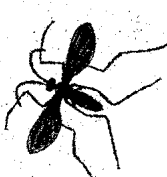
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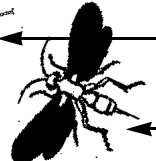
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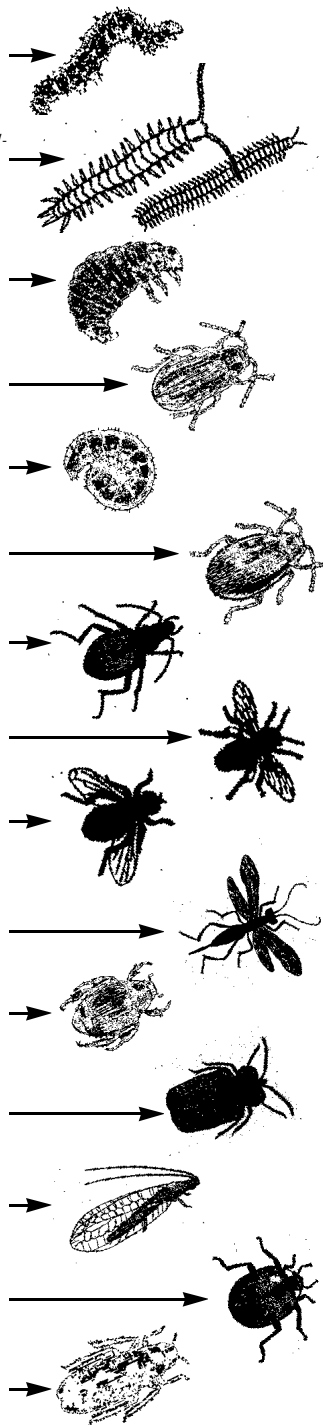
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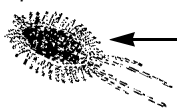
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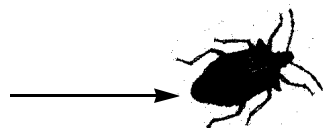


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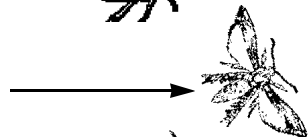
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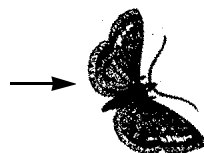
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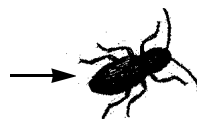
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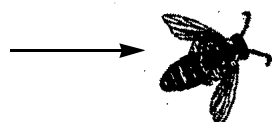
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GETTING TO KNOW YOUR GARDEN GUESTS

No one wants pests in their yard and garden. Yet at one time or another, we've all had to deal with insects that eat holes in our favorite flowers, vegetables, or fruit. Maybe they've even led you to exterminate your entire yard. But that's not the answer. After all, the pest insects that eat our treasured ornamentals and rob a share of the vegetable harvest are only a tiny fraction of the total insect population around us. Many bugs are actually beneficial in their roles as crop pollinators, pest predators, and plant-material decomposers.

So why not get to know who's visiting your garden? You'll find that the most important part of keeping a garden healthy is being able to recognize your garden friends and foes.

Practicing Prevention

If you can avoid pest problems in the first place, you'll save your time and your garden. There are several simple practices you can add to your garden routine to help prevent pest problems. Here are some things you can try:

Build up your soil. There's no easier or more effective way to grow pest-free plants than by improving your soil. Add an inch or two of compost to poor soil each spring until drainage and fertility are restored. A yearly side-dressing or sprinkle of compost in spring will keep soil in good shape thereafter.

Rotate crops. Whenever you pull out a crop, put a different one in. You'll discourage pests that were attracted to the original crop and stop insect populations from building up.

Grow a wide variety of plants. Large plantings of a single plant draw insects like magnets. Confuse pests by mixing many types of flowers and vegetables. Pests will have trouble finding their favorite plant snacks and may move on to easier pickings elsewhere.

Plant healthy plants. Don't import insect problems from the garden center or nursery. An aphid-infested "bargain"

plant is no bargain when it leads to a garden full of infested, stressed, and sickly-looking plants. So every time you go shopping, take along this insect identification guide.

Select resistant cultivars. Choosing plants that can natu-



Insect Aside

Bright, colorful clothing can do a lot for your disposition, but you may be picking up more than just your spirits when you wear such fashions into the garden. Some insect pests are attracted to bright colors.

rally repel or resist insect problems is one of the simplest ways to avoid pest problems. New resistant cultivars are being introduced each season.

Keep the garden clean. Pests find hiding and breeding places beneath old leaves, stalks, and stems, so remove and compost faded plant parts regularly.

Evict pests before you plant. Examine the garden site carefully and evict all of the pests that you find. Remember to look under rocks, boards, and surface debris.

Put up pest barriers. There's a good reason why floating row covers made of superlight spunbonded polypropylene are so popular among gardeners: These inexpensive, gauzy barriers keep pests off plants while allowing light and moisture to pass through. And they're easy to use: You just drape the fabric over your crops and perhaps weight it down with rocks. You can provide even more protection by tucking the edges of the row cover firmly into the soil.

Collars made of cardboard, plastic, or metal can also deter some pests.

Becoming a Pest Detective

Sometimes you try to do everything right, but pests still find their way to your garden. When you suspect pests are at

work in your garden, the first step is to identify the assailant. Sometimes you can catch the pest in the act, but often you'll have to figure it out based on the type of damage. Here are some hints to help you identify the culprit.

Join the pest patrol. All the planning in the world won't help if you don't keep a watchful eye out for problems. Make it a habit to walk through your garden at least once a week—in early morning if you can—while the air is cool and moist. Insects are cold-blooded and can't move very fast until the sun heats them up.

Give plants a thorough inspection, checking the undersides of leaves and the stems, flowers, and roots for insects, eggs, webs, or damage.

Most insect problems can be solved in seconds if you spot them in time. At this stage, a blast of water or a pinch of your fingers may be all it takes to stop pests dead in their tracks. Look before you squish, though. You don't want to destroy insects that aren't causing problems. Keep this reference guide handy until you can distinguish between the bad bugs and the good ones—who may be feasting on the very pests you're trying to control.

Take notes. If you find damage, jot down a few notes: the identity of the affected plant, the plant parts that are affected, and the kind of damage. You can even collect sample insects and samples of damaged leaves for later identification. Put them in pill bottles or plastic bags so you can examine them later with a magnifying glass.

If you can't seem to pinpoint the pest, you may want to take your notes and any evidence to your local Cooperative Extension Service or garden center for help in making an accurate diagnosis.

Record your trials and errors. Make notes about what works to control the pests and what doesn't. The more information you have, the better you'll be able to refine your plan for the next season.

Putting Pests under Arrest

There are many techniques specific to the species that can



Insect Aside

You can use a hand-held rechargeable vacuum cleaner to suck whiteflies, Japanese beetles, Colorado potato beetles, and cucumber beetles off your plants. Hold your portable vacuum in one hand and move it lightly over the tops of the plants. Support the foliage with your other hand to lessen the chance of damage to tender leaves and shoots. Limit vacuuming to the upper leaves of plants to avoid sucking up fragile beneficial wasps, which tend to stay near lower parts of plants.

The vacuumed insects will be stunned by their forced evacuation but probably not killed. So be prepared to open the vacuum (away from your plants) afterward and dump the pests into soapy water.

help you control insect pests (we'll get to those in the identification guide). But there are also a few techniques that work to control any pest

Spray them with water. Blasting spider mites and soft-bodied insects like aphids with a strong stream of water from your hose can knock them from the plant or kill them outright. Be sure to get the undersides of the leaves, too.

Handpick them. Some insects are big enough to pick off. These include caterpillars, large beetles, and slugs. Squash them, or drop them into a bucket of soapy water. The soap reduces the surface tension of the water, so the pests sink rather than swim. In the morning, when insects are too cold to move, you can shake pests off your plants onto a sheet, which you then empty into the soapy water. To flush out hidden pests, try spraying plants with a fine mist of water.

Trap them. Trapping works for small populations. Don't use it for heavy infestations, or you'll attract more pests to your yard. Buy commercially available traps that are coated on the inside with sex hormones and floral fragrances that attract specific insects.

Save the sprays for last. Organic gardeners save insecticidal and fungicidal sprays and dusts for the last resort. They

know the possible hazards to the environment, to beneficial insects and animals, and to their own safety. But, on rare occasions, pest problems do require intervention with dusts and sprays.

Bringing In the Good Bugs

One easy, effective way to reduce insect problems is to make your garden a comfortable home for beneficial insects. Here's how:

Offer them a drink. Hot, dry, summer weather can be hard



Insect Aside

You had aphids all over your broccoli last season, and you're determined not to let it happen again, so you launch an all-out effort. You dump hundreds of mail-order lady beetles on your plants. Every 3 days, you turn a hose on the leaves to knock off any pests. You spray the plants with horticultural oil. And, sure enough, your broccoli thrives, 100 percent aphid-free.

Trouble is, you have no way of knowing which of those techniques worked and which didn't. If you want to know whether a pest-control technique is effective, you have to try one method at a time.

The best way to test a method is to try it on one part of a crop and to leave the rest of that crop entirely alone. It's the only way to tell whether a given technique is better than doing nothing at all.

on beneficial insects. To make a "bug bath" for your garden, partially fill an old birdbath or some other container with rocks or gravel, then add just enough water to keep the stones moist. Because the insects can drown in standing water, you'll need to create wet surfaces with lots of dry islands.

Give them flowers. To draw beneficial bees, wasps, and flies to your garden, grow some of the small, flowering plants they prefer. Members of the mint, carrot, and daisy families seem to be especially attractive to beneficials. Or there's an even easier way: Just let some of your vegetables bolt and

flower. Radishes, Chinese cabbage, mustard, parsley, and broccoli all produce blossoms that entice beneficials.



Insect Aside

Some gardeners try to tip the balance in favor of beneficial insects by buying some to release into the garden. Depending on the insect, this approach can work if there are enough pests for the beneficial insects to feed on.

At the Rodale Institute Research Center, researchers have studied beneficial insect habitats. They recommend planting the following plants in and around your garden beds and borders to attract and nurture beneficial insects: buckwheat, caraway, crimson clover, white clover, ‘White Sensation’ cosmos, dill, fennel, hardy marguerite, ‘Lemon Gem’ marigold, spearmint, and common tansy.

Use “spider mulch.” Mulching your crops with hay or dried grass when you plant in the spring will attract spiders—a formidable natural “pesticide” that can drastically reduce insect damage in vegetable gardens.

To Squash or Not?

Managing pest populations necessitates an awareness that not all bugs are bad. Not every insect that sits on a flower is there for a meal. By observing your garden often and well and using the identification guide that follows, you’ll learn to recognize which insects do damage, which are good guys that eat bad guys, and which ones are just passing through.

MAKING A POSITIVE IDENTIFICATION

Becoming familiar with the creatures that live on and around your plants is a key part of creating a healthy, successful garden. As you work in or walk through the garden, take time to really look at your plants and the insects that are present. Then flip through this identification guide. Eventually, you'll begin to recognize some of the most common pests and beneficial insects. By learning which are harmful and which are helpful, you'll know which ones to control and which ones to protect.

BUG SHOT



BAD BUG

Aphid

Aphids keep numbers on their side: They cluster on many of our favorite garden plants and houseplants.

Last Seen in the Vicinity of . . .
North America.

Crime

Both adults and nymphs suck plant sap from most fruits, vegetables, flowers, ornamentals, nuts, herbs, fruit and shade trees, and conifers. Their feed-

ing often causes distorted leaves, buds, and flowers; severely infested leaves and flowers may drop. As they feed, aphids secrete a sweet honeydew onto leaves below, which supports growth of sooty mold. Some aphids spread plant viruses as they feed.

Description

Adults are soft, pear-shaped insects, $\frac{1}{16}$ to $\frac{3}{8}$ inch long, with two short tubes (called cornicles) projecting backward from

the tip of the abdomen. They have long antennae and may be green, pink, yellowish, black, or powdery gray in color. They can be either winged or wingless. Winged forms appear in response to crowding or to changes in the host plant. Aphid wings are transparent, longer than the body, and held rooflike over the back. Nymphs are similar to adults, but smaller and wingless.

Crime Prevention

- ✿ Maintain healthy plant growth, but do not overfertilize with nitrogen.
- ✿ Attract native predators and parasites by planting pollen and nectar plants.
- ✿ Release purchased aphid midges, lady beetles (these tend to fly away, so they're more effective for greenhouses), lacewings, or parasitic wasps. Consult suppliers to find out the best species and release rates for your local conditions.

Sentence

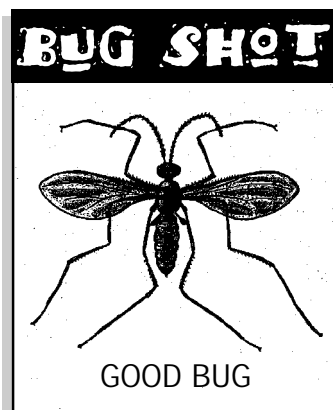
- ✿ Spray plants with a strong stream of water to knock aphids off.
- ✿ Spray insecticidal soap, neem extract, summer oil (on tolerant plants), homemade garlic sprays, or, as a last resort, pyrethrins.

Aphid Midge

Their size is no indication of their power: The orange larvae of the tiny aphid midge can protect your garden from more than 60 aphid species.

Patrol Route

Aphid midges are common throughout North America; they're also sold commercially.



Good Deed

Larvae paralyze aphids with toxic saliva, then suck their body fluids.

Description

Adults are delicate, long-legged flies, $\frac{1}{16}$ inch long. They are active at night. Larvae are orange maggots up to $\frac{1}{8}$ inch long. Eggs are minute orange ovals.

Getting Them on Your Side

- ✿ Plant pollen and nectar plants to attract adults.
- ✿ Shelter the garden from strong winds with a windbreak.
- ✿ Provide a source of water in dry weather.
- ✿ To supplement native aphid midge populations, purchase 200 to 300 cocoons for a small garden, orchard, or greenhouse; for larger areas, release 3 to 5 cocoons per plant or 5 to 10 per orchard tree.



Armyworm

Armyworms do their dirty work in the dark: They feed together in groups at night and hide during the day in the centers of plants or under leaf litter.

Last Seen in the Vicinity of . . .

New Mexico, Arizona, and California, as well as east of the Rockies and in southeastern Canada.

Crime

Larvae feed on lawn grasses, garden plants, corn, and other crops, particularly asparagus, beans, beets, cabbage, cucumbers, lettuce, spinach, and tomatoes. When food supply is depleted, they move en masse to a new location. Larvae can consume whole plants overnight.

Description

Adults are pale, grayish brown moths with 1½- to 2-inch wingspans. They have a white dot in the center of each forewing. Because they fly at night, they are seldom seen. The young caterpillars, or armyworms, are smooth, pale green, and up to 1½ inches long. Older armyworms are greenish brown with white side stripes and dark or light stripes along their backs. The moths lay their greenish white egg masses on lower leaves.

Crime Prevention

- ✿ Attract native parasitic wasps and flies by planting pollen and nectar plants.
- ✿ Control grassy weeds where infestations often start.

Sentence

- ✿ Spray *Bacillus thuringiensis* var. *kurstaki* (BTK) or neem extract to control the caterpillars.
- ✿ Spray summer oil (on plants that tolerate oil sprays) in July to kill eggs.
- ✿ After harvest, turn the soil to expose pupae to natural enemies.

Assassin Bug

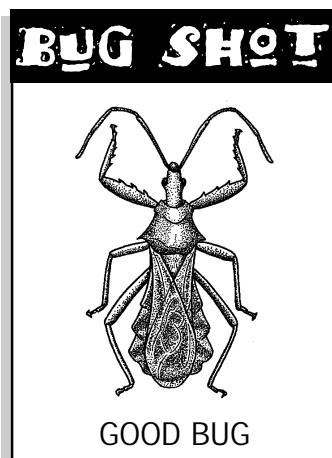
Assassin bugs aren't picky in their taste for pests: They feed on flies, mosquitoes, beetles, caterpillars, and other insects (even bed bugs).

Patrol Route

Assassin bugs are found throughout North America.

Good Deed

Assassin bugs are general predators that help suppress populations of flies, beetles, caterpillars, and other insects.



Description

Adult assassin bugs are somewhat flattened, oval, $\frac{1}{2}$ to 1 inch long, with long, narrow heads and stout, curving beaks. Some have an elaborately flared or sculptured thorax. They may bite when handled; some species squeak. Nymphs are similar to adults in appearance, but smaller and wingless. Some are brightly colored; others camouflage themselves by sticking debris or trash to their bodies.

Getting Them on Your Side

Assassin bugs are naturally present in most gardens, so simply avoid using pesticides.

BUG SHOT



BAD BUG

Black Vine Weevil

Black vine weevils are double trouble: There are only female weevils, so every weevil lays eggs.

Last Seen in the Vicinity of . . .

The northern United States and southern Canada.

Crime

Adults chew along leaf edges, leaving characteristic small, scalloped bite marks on the edges. They rarely cause serious harm, but larvae can be very damaging because they feed on roots. Their feeding stunts plants and may indirectly kill them by allowing disease organisms to enter injured roots. Black vine weevils most commonly attack blackberry, blueberry, cranberry, and strawberry plants, as well as some ornamentals, particularly azaleas, camellias, rhododendrons, wisteria, and yews. Potted nursery stock is often attacked.

Description

Adults are flightless, oval, brownish gray or black “snout beetles,” $\frac{1}{3}$ inch long, with small yellow patches on their

backs. Larvae are fat white grubs up to ½ inch long, with yellowish brown heads. Their tiny white eggs are laid in soil.

Crime Prevention

- ❁ Plant resistant rhododendron and azalea cultivars, which have rolled leaf edges that prevent weevils from grasping the edge to feed.

Sentence

- ❁ Shake weevils off plants at night onto a dropcloth and destroy them by dropping them into a pail of soapy water.
- ❁ If leaf damage is severe, cover beds of small plants with floating row covers to stop weevils from reaching the plants to lay eggs.
- ❁ Spray *Bacillus thuringiensis* var. *san diego* (BTSD) when adults are feeding on the foliage.
- ❁ Apply a solution of insect parasitic nematodes (well watered-in) to the soil to control larvae in late spring or early fall.
- ❁ Intercept adults climbing up shrubs by tying a 6-inch-high band of plastic wrap painted with sticky trap glue around the trunk.

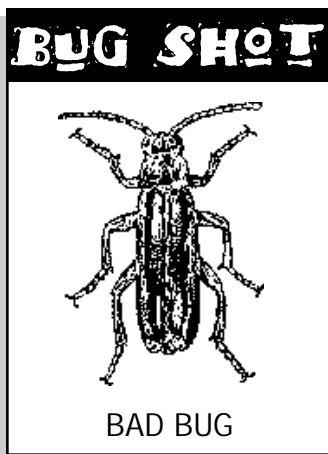
Blister Beetle

Blister beetles can be both friend and foe: Adults feed on garden plants; larvae eat grasshopper eggs.

Last Seen in the Vicinity of . . .
North America.

Crime

Large numbers of adults feeding on flowers and foliage of many types of flowers, shrubs, and vegetables rapidly defoliate plants. Larvae of most species are beneficial because they prey on grasshopper eggs.



Description

Adults are metallic black, blue, purple, or brown beetles, $\frac{3}{4}$ inch long, with soft, elongated bodies, narrow “necks,” and long legs. The youngest larvae are tiny, narrow, elongated grubs with large heads; later stages are progressively fatter with smaller heads and shorter legs.

Crime Prevention

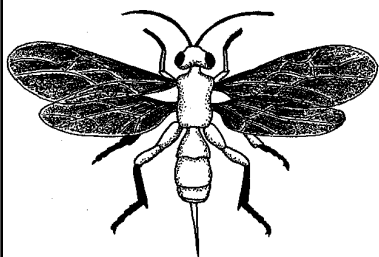
- ✿ Protect plants with floating row covers or screens in mid-summer.

Sentence

Except in areas where large adult populations do severe damage, tolerate adults to reap beneficial effects of larvae. In those areas:

- ✿ To kill adults, knock them from plants into a pail of soapy water (wear gloves to avoid contact with crushed beetles, which causes skin burns).
- ✿ For severe infestations, spray pyrethrins.

BUG SHOT



GOOD BUG

Braconid Wasp

Although braconid wasps are so tiny that you rarely see them, you'll know they're at work: You'll see their white-to-brown cocoons on parasitized hosts.

Patrol Route

Braconid wasps are found throughout North America; some are also sold commercially.

Good Deed

Braconid wasps are important native parasites of pests such as codling moths, elm bark beetles, cabbageworms, hornworms, corn borers, armyworms, aphids, and others. Some species attack flies and other insects. Many species develop

as parasites inside the host insect; others paralyze the host, and the wasp larvae develop as external parasites.

Description

Adults are slender, black or brown, $\frac{1}{10}$ - to $\frac{1}{2}$ -inch-long wasps with narrow waists. They do not sting. Larvae are tiny cream-colored grubs that feed in or on other insects.

Getting Them on Your Side

Although some braconid wasp species are available by mail order, the best course for the homeowner is to attract native populations.

- ✿ Grow nectar plants with small flowers, such as corn spurry, dill, lemon balm, mustard, parsley, white clover, wild carrot, stinging nettle, and yarrow.

Bumblebee

Protect bumblebees to keep garden yields high: They are important native pollinators of fruit and vegetable crops.

Patrol Route

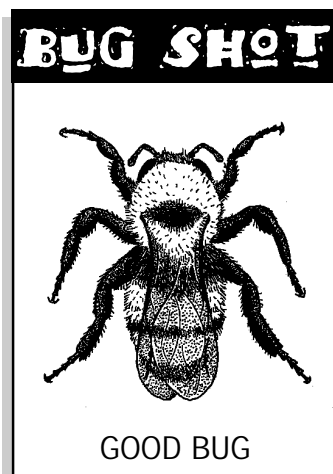
Bumblebees are common throughout North America; they're also sold commercially.

Good Deed

Bumblebees are important wild pollinators for a variety of fruit and seed crops. Bumblebee colonies are sold commercially for use in greenhouses to pollinate tomatoes and peppers.

Description

Adults are plump, black-and-yellow, fuzzy bees, $\frac{1}{2}$ to 1 inch long. They are able to fly in very cool weather. Larvae are fat white grubs, found in cells in the nest.



Getting Them on Your Side

Bumblebees are common in most gardens. To keep them coming to yours:

- ✿ Protect bees by minimizing spraying or by spraying only in evenings after bees return to their nest.
- ✿ Plant pollen and nectar flowers, and allow dandelions to bloom to provide early pollen.



Cabbage Looper

Watch closely and you'll see where these pests get their name: They're called loopers because of their habit of humping their bodies up into a loop, especially when disturbed.

Last Seen in the Vicinity of . . .

The United States and southern Canada.

Crime

Larvae damage plants by chewing large holes in leaves. If they are numerous, they can ruin whole plants. Cabbage loopers mainly attack cabbage and cabbage-family plants, but will also feed on beets, celery, lettuce, peas, spinach, tomatoes, and flowers, including carnations, nasturtiums, and mignonette.

Description

Adult cabbage loopers are mottled gray-brown moths with a silvery, V-shaped spot in the middle of each forewing and wingspans ranging from 1½ to 2 inches. They are rarely seen because they fly late in the evening. The larvae are green, 1½-inch-long caterpillars with a pair of wavy, white or light yellow lines extending down their backs and one line along each side. The females lay their light green, dome-shaped eggs singly or in groups of two or three on the undersides of leaves.

Crime Prevention

- ✿ Attract native parasitic wasps by planting pollen and nectar plants.
- ✿ Till all crop residues into the soil before adults emerge in spring.
- ✿ For gardens in northern latitudes, start cabbage indoors and plant out very early to avoid peak populations of cabbage loopers.

Sentence

- ✿ For small gardens, handpick caterpillars several times weekly.
- ✿ Spray *Bacillus thuringiensis* var. *kurstaki* (BTK), neem extract, or pyrethrins.

Centipede, Millipede

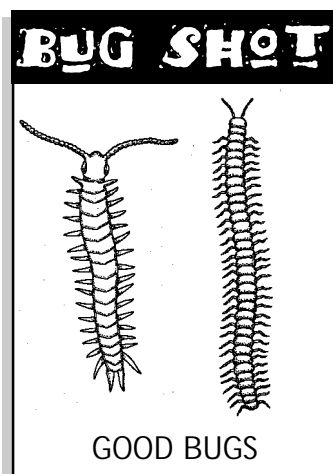
The good deeds of centipedes and millipedes usually outweigh their sins: They'll take care of many soil-dwelling pests, while only occasionally snacking on plant parts and earthworms.

Patrol Route

Centipedes and millipedes are found throughout North America.

Good Deed

Centipedes are generally good predators of soil-dwelling pests, including slugs. They may also feed on earthworms, but overall, centipedes are considered to be beneficial. Millipedes feed primarily on decaying plant material, such as dead leaves, manure, or compost. They are beneficial in breaking down organic matter, but may occasionally feed on plant roots, germinating seeds, and seedlings. They may also chew on fruits that rest on the ground, such as strawberries and tomatoes.



Description

Adults are slender, segmented creatures with many legs. Centipedes are 1 to 5 inches long, have fewer, longer legs (with only one set of legs per segment), and move quickly. Millipedes are ½ to 1½ inches long, move slowly, and have numerous short legs (two sets of legs per segment). Some millipedes curl up when disturbed. Centipedes have poisonous “claws” behind their head that they use to grab prey. Smaller species are usually harmless to people; larger species can inflict a painful bite.

Getting Them on Your Side

Preserve centipede and millipede populations in your garden by avoiding the use of pesticides. Control is generally not necessary unless populations are unusually high. But to sufficiently deter them:

- ✿ Allow the soil surface to dry out around seedlings.
- ✿ Sprinkle wood ashes, natural-grade diatomaceous earth, or cinders along rows of germinating seeds.
- ✿ Keep fruit off the ground with straw mulches.

BUG SHOT



BAD BUG

Colorado Potato Beetle

When Colorado potato beetles breed a new generation of pests, they mean business: The females lay up to 1,000 eggs each during their several-month lifespans.

Last Seen in the Vicinity of . . .

North America, except California, Nevada, and the west coast of Canada.

Crime

Both adults and larvae chew on leaves and stems of potatoes, tomatoes, eggplants, and related plants, including petunias. Young plants may die, while older plants can be

severely defoliated. A moderate amount of feeding, however, does not harm plants.

Description

Adult Colorado potato beetles are yellowish orange and $\frac{1}{3}$ inch long, with 10 lengthwise black stripes on their wing covers and many black spots on their middle section. Larvae are dark orange, humpbacked grubs, $\frac{1}{16}$ to $\frac{1}{2}$ inch long, with a row of black spots along each side. Eggs are bright yellow ovals.

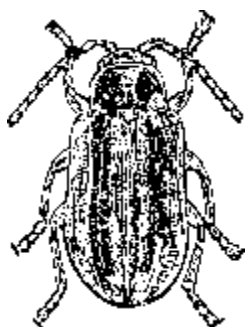
Crime Prevention

- ✿ Attract native predators and parasites with pollen and nectar flowers.
- ✿ Mulch plants with deep straw, which seems to impede the movement of beetles in early spring before they've fed enough to be able to fly.
- ✿ Cover plants with floating row covers until midseason.
- ✿ In the fall, till the soil to kill overwintering beetles.

Sentence

- ✿ Starting in early spring, inspect shoots and undersides of leaves for adults, egg masses, and larvae, and crush them.
- ✿ On older plants, early in the morning, shake adults from plants onto a ground sheet and destroy them by dropping them into a pail of soapy water.
- ✿ Release two to five spined soldier bugs per square yard of plants.
- ✿ Release parasitic wasp *Edovum puttleri* in southern areas to attack second-generation larvae.
- ✿ To control larvae, spray neem extract or *Bacillus thuringiensis* var. *san diego* (BTSD) as soon as eggs are present; control both adults and larvae by spraying weekly with pyrethrins.

BUG SHOT



BAD BUG

Cucumber Beetle, Striped

Striped cucumber beetles can cause double damage to plants: As they feed, they spread diseases such as wilt and viruses.

Last Seen in the Vicinity of . . .

The United States west to Colorado and New Mexico, and in Canada west to Saskatchewan.

Crime

Adults feed on squash-family plants, beans, corn, peas, and blossoms of many garden plants. The beetles swarm on seedlings, feeding on leaves and young shoots, often killing plants. They also attack stems and flowers of older plants and eat holes in fruit. The beetles are thought to transmit bacterial wilt and mosaic viruses, which often cause more damage than the bugs' direct feeding. The larvae feed on roots of squash-family plants, which stunts and sometimes kills plants.

Description

Adult striped cucumber beetles are yellow, elongated insects, $\frac{1}{4}$ inch long. They have black heads and three wide black stripes on their wing covers. Larvae are slender white grubs with reddish brown heads. They are legless and up to $\frac{3}{4}$ inch long.

Crime Prevention

- ✿ Plant cucumber, melon, and squash cultivars that are resistant to mosaic and bacterial wilt.
- ✿ Where adults are numerous, cover seedlings or plants with floating row covers and hand-pollinate covered squash-family plants.
- ✿ Mulch plants with deep straw to impede the movement of adults.

Sentence

- ☛ Apply insect parasitic nematodes to the soil around squash-family plants to help control the larvae.
- ☛ Spray or dust with pyrethrins when you see beetles feeding on pollen in flowers.

Cutworm

Cutworms leave a simple clue to their identity: Severed stems of young plants lie on the ground when you check on your garden in the morning.

Last Seen in the Vicinity of . . .
North America.

Crime

The moths do not damage plants, but cutworm caterpillars can be very destructive in some years. They feed at night on young plants, most early vegetables and flower seedlings, shoots, and transplants, usually cutting the stem at or just below the soil line so that the plant topples over. They may completely consume seedlings. During the day, they rest just below the soil surface, curled beside the stems of damaged plants.

Description

Adults are large, brownish or gray moths with 1½-inch wingspans. Larvae are fat, greasy gray or dull brown caterpillars with shiny heads. There are several species of cutworms. Most are found in the soil, although some also climb plants.

Crime Prevention

- ☛ Protect transplants from damage by using cutworm collars around the stems. Collars can be made of cardboard, plastic, or small tin cans with both ends removed. Press them an inch into the soil.



- ❁ Avoid the main population of cutworms by planting later in the season.

Sentence

- ❁ To clear the soil of cutworms before planting, scatter moist bran mixed with *Bacillus thuringiensis* var. *kurstaki* (BTK) and molasses a week before setting out plants, or drench soil with neem extract or a solution of insect parasitic nematodes, both before and after transplanting.
- ❁ Dig around the base of damaged transplants in the morning and destroy hiding larvae.
- ❁ To control climbing cutworms, spray plants with neem extract.

BUG SHOT



BAD BUG

Flea Beetle

Flea beetles can make a quick getaway when disturbed: They have enlarged legs that enable them to jump like fleas.

Last Seen in the Vicinity of . . .
North America.

Crime

Adults chew small, round holes in leaves of most vegetable crops as well as many flowers and weeds. Flea beetles are most damaging in early spring, when seedlings may be killed by a heavy infestation of adults. Larger plants usually survive and outgrow the damage, unless the plants were infected with a virus spread by the beetles. The larvae feed on plant roots, and, in some species, such as the tuber flea beetle, the larvae do the most damage.

Description

Adults are tiny, active, black, brown, or bronze beetles, $\frac{1}{10}$ inch long. They have enlarged hind legs and jump like fleas

when disturbed. The larvae live in the soil and are thin, white, legless grubs with brown heads, up to ¼ inch long.

Crime Prevention

- ✿ Plant susceptible plants as late as possible to avoid the most damaging generation.
- ✿ Cover seedlings with floating row covers until adults die off.
- ✿ Flea beetles prefer full sun, so interplant crops to shade susceptible plants.

Sentence

- ✿ Drench roots with insect parasitic nematodes to control larvae.
- ✿ Spray pyrethrins to control adults.

Ground Beetle

Ground beetles are your secret heroes: They feed on slugs, snails, and other soil-dwelling pests by night and hide under stones and boards by day.

Patrol Route

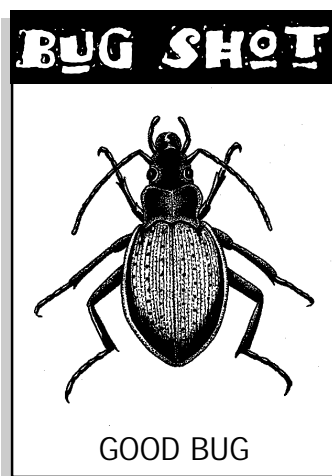
Ground beetles are common throughout North America.

Good Deed

Ground beetles prey on slugs, snails, cutworms, cabbage root maggots, and many other pests that have a soil-dwelling stage. Some species also pursue prey that live on plants or trees, such as Colorado potato beetle larvae, gypsy moths, and tent caterpillars. A single larva can eat more than 50 caterpillars.

Description

Adults are large, iridescent, blue-black or purplish brown beetles, ¾ to 1 inch long, with long legs and a well-defined



thorax that's usually narrower than the abdomen. Larvae are dark brown or black grubs with 10 segments, tapering markedly toward the rear. They have large mandibles for grasping prey.

Getting Them on Your Side

- ✿ Provide permanent beds and perennial plantings in the garden to protect populations.
- ✿ Plant white clover groundcover in orchards.
- ✿ Make permanent stone, sod, or clover pathways throughout the garden to provide refuges.



Honeybee

Honeybees are very worthy of our appreciation: Besides providing honey, they pollinate fruit and vegetable crops.

Patrol Route

Honeybees are found throughout North America.

Good Deed

Honeybees are extremely important pollinators of fruit, vegetables, and agricultural crops; it's estimated that more than 80 percent of pollination is done by domestic honeybees.

Description

Adults are fuzzy, gold-and-black-striped insects, $\frac{3}{4}$ inch long, with transparent wings; they are often seen visiting flowers. Larvae are white grubs found in wax honeycombs in beehives.

Getting Them on Your Side

- ✿ Provide a water source in dry weather.
- ✿ Avoid spraying fruit trees when flowers are in bloom.

- ☼ Plant pollen and nectar plants that bloom before or after the main fruit bloom (so they don't lure bees away from fruit flowers).
- ☼ If you must apply insecticides, spray in the evening, after bees return to their hive.

Hoverfly

Hoverflies are one of your best weapons against aphids: One larva will feast on 400 aphids during its development.

Patrol Route

Various species of hoverflies are common throughout North America.

Good Deed

Larvae feed on many species of aphids; one larva can eat about 400 aphids during its development. They are common in orchards and are particularly strong fliers, good at finding aphid colonies, even in windy areas.

Description

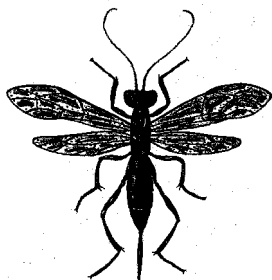
Adults are robust, shiny, yellow-and-black- or white-and-black-striped flies, $\frac{3}{8}$ to $\frac{1}{2}$ inch long, with large eyes. They hover over flowers like miniature hummingbirds. Hoverflies—also known as flower flies—may resemble honeybees, but hoverflies have only one pair of wings and don't sting. Larvae are gray or greenish, somewhat translucent, sluglike maggots up to $\frac{1}{2}$ inch long. Eggs are tiny white cylinders laid singly or in small groups near aphids.

Getting Them on Your Side

- ☼ Plant pollen and nectar plants.
- ☼ Allow flowering weeds such as wild carrot and yarrow to grow between crop plants.



BUG SHOT



GOOD BUG

Ichneumon Wasp

Don't judge these bugs by their covers: The large ovipositors (specialized organs for depositing eggs) look like stingers, but they're harmless to people. In fact, ichneumon wasps are just the kind of bugs you want to keep around.

Patrol Route

Numerous species of ichneumon wasps are found throughout North America.

Good Deed

Ichneumon wasps lay their eggs inside other host insects, including caterpillars and sawfly and beetle larvae. The wasp larvae develop as parasites and kill the host. Adult females also kill hosts by stinging them and feeding on their body fluids.

Description

Adults are slender, thin-waisted, usually dark-colored wasps, $\frac{1}{10}$ to $1\frac{1}{2}$ inches long, with long antennae. Some species have threadlike ovipositors (specialized organs for depositing eggs but sometimes mistaken for stingers) up to 3 inches long. Larvae are white, tapering grubs.

Getting Them on Your Side

- ✿ Plant pollen and nectar flowers in gardens.
- ✿ Allow flowering weeds such as wild carrot and yarrow to remain in waste areas and hedgerows.
- ✿ Grow flowering cover crops in orchards to attract females.

Japanese Beetle

Adult beetles aren't hard to identify: If you see skeletonized leaves, you'll also see enough of these metallic-bronze pests around to make a positive ID.

Last Seen in the Vicinity of . . .

All states east of the Mississippi River and occasionally in California.

Crime

Adults feed during the day, especially in warm weather and on plants in full sun. They chew on flowers and skeletonize leaves, which wilt and drop; if populations are large, they may completely defoliate plants. Japanese beetles feed on a wide range of vegetables (especially asparagus, beans, corn, okra, onions, rhubarb, and tomatoes), trees, shrubs, vines, and fruits, as well as many flowers and ornamentals. Larvae feed on roots of turf and other grasses, causing irregular patches of dead or wilted turf in spring and again in fall. Turf may be torn up by crows, raccoons, and other animals searching for larvae.

Description

Adults are blocky, metallic blue-green beetles, $\frac{1}{2}$ inch long, with tufts of white hairs along the sides of the abdomen. They have bronze-colored wing covers and long legs with large claws. Larvae are fat, dirty white, C-shaped grubs, up to $\frac{3}{4}$ inch long, with brown heads; they are found in sod.

Crime Prevention

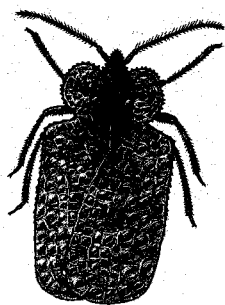
- ❖ Cover plants with floating row covers.
- ❖ Attract native species of parasitic wasps and flies with nectar and pollen plants.
- ❖ Allow your lawn to dry out well between waterings in midsummer, or stop watering and allow the lawn to go dormant in summer, so beetle eggs dry out.



Sentence

- ✿ In early morning, handpick beetles, vacuum them from plants with a hand-held vacuum cleaner, or shake them from plants onto ground sheets and destroy them.
- ✿ To control larvae, apply milky disease spores or insect parasitic nematodes to the sod.
- ✿ Organize a communitywide trapping program (placing traps in a single yard has been shown to be ineffective).
- ✿ Aerate the lawn with spiked sandals in late spring and early fall to kill larvae while they are close to the surface.

BUG SHOT



BAD BUG

Lacebug

Lacebugs may be targeting your rhododendrons and azaleas: Check for the small dark spots of excrement they leave when they feed.

Last Seen in the Vicinity of . . .

North America.

Crime

Adults and nymphs suck juices from flowers and the undersides of leaves. They produce dark spots of excrement and cause yellowish patches or a speckled white or gray blotchy appearance on the leaf surface. Light feeding causes little damage, but in large numbers, lacebugs may cause the death of foliage and stems. They feed on flowers, ornamental trees, vegetables, and many garden plants.

Description

Adults are oval- or rectangular-shaped bugs, $\frac{1}{10}$ inch long, with a lacy pattern on the wings and unusually wide, flattened extensions on the thorax. Nymphs are smaller and darker and may be covered with spines. Eggs are inserted in leaf tissue along a midrib on the underside, with a conelike cap projecting from the leaf.

Crime Prevention

- ✿ Maintain healthy plants.

Sentence

- ✿ For heavy infestations, spray insecticidal soap or pyrethrins in mid-May and again 10 days later, to control both adults and nymphs.
- ✿ Summer oils are also effective on trees and plants that can tolerate oil sprays.

Lacewing

Lacewing adults aren't the ones protecting your garden: It's their larvae that are voracious predators of aphids and other pests.

Patrol Route

Lacewings are found throughout North America; some species are also sold commercially.

Good Deed

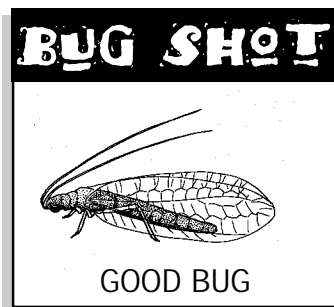
Larvae feed on aphids, thrips, mealybugs, scales, moth eggs, small caterpillars, other soft-bodied insects, and also mites. The adults usually are not predators.

Description

Adults are delicate, green or brown insects, $\frac{1}{2}$ to $\frac{3}{4}$ inch long, with small heads and large eyes. Their wings are transparent and covered with a network of fine veins. Larvae are spindle-shaped, mottled yellow or brown, with tubercles (small, knobbly protuberances) on their sides and large, curved mandibles (mouthparts); they resemble tiny alligators. Eggs are laid on tips of fine stalks.

Getting Them on Your Side

- ✿ Plant pollen and nectar flowers to attract adults.
- ✿ Let some flowering weeds grow between garden plants.



- ❁ Provide a water source during dry weather.
- ❁ When using purchased lacewings, distribute the eggs widely throughout the garden; larvae are cannibalistic when crowded. A minimum order of 500 to 1,000 eggs is sufficient for the average garden.



Lady Beetle

Don't let those lady beetles—also known as ladybugs or ladybirds—fly away home: They belong to one of the most beneficial families of insects.

Patrol Route

Numerous species of lady beetles are found throughout North America; convergent lady beetles and other species are also sold commercially.

Good Deed

Both lady beetle adults and larvae feed on aphids and soft-bodied pests, as well as on insect eggs. Larvae of many species consume 200 to 300 aphids during their development; adults eat 300 to 400 aphids in month. Some species prefer mealybugs, spider mites, or soft scales. A few lady beetle species, such as the Mexican bean beetle and squash beetle, are plant pests.

Description

Adults are shiny, round beetles, $\frac{1}{16}$ to $\frac{3}{8}$ inch long, with short legs and antennae; the head is hidden beneath the front of the thorax. Common species are ash gray with dark spots or pale yellow to dark reddish orange, with or without black spots; some species are solid black or black with two red spots. Larvae are generally spindle-shaped, up to $\frac{3}{8}$ inch long, usually with short spines, warts, or tubercles (small, knobby protuberances) on each segment; most are a dark

color with yellow, red, or white spots. Eggs are white or yellow ovals, usually deposited in upright clusters.

Getting Them on Your Side

- ✿ Plant pollen and nectar flowers, especially angelica and dill, to attract adults.
- ✿ Let weeds such as dandelions, wild carrot, and yarrow grow among crop plants.
- ✿ Purchased convergent lady beetles are quite effective in controlling aphids in greenhouses if all vents are screened to prevent their escape. However, they may fly away from gardens. To encourage them to stay a while, water the garden thoroughly, and wait until nighttime to release the beetles; adequate moisture and an ample supply of aphids may entice them to make a home in your garden.

Leafhopper

Leafhoppers may look pretty, but they're troublemakers: The small, brightly colored pests feed on stems and the undersides of leaves.

Last Seen in the Vicinity of . . .
North America.

Crime

Both adults and nymphs suck juices from stems and undersides of leaves, giving leaves a light, mottled appearance. Their toxic saliva causes some plants to react with severe leaf distortions, including warty, crinkled, or rolled edges and yellowed, curled leaves with white spots on the undersides. As they feed, leafhoppers excrete sticky honeydew on leaves below. Fruit may be spotted with drops of excrement and honeydew (you can wash this off). Many species spread plant viruses and other disease-causing organisms. Leafhoppers attack flowers, fruit trees, and vegetables, especially apple trees, beans, eggplants, grapes, peanuts,



potatoes, and squash-family plants. They also feed on some ornamentals and many varieties of weeds.

Description

Adults are wedge-shaped and slender and range from $\frac{1}{10}$ to $\frac{1}{2}$ inch long. Many species have a broadly triangular head or a pronounced forward point to the head. Most are either brown or green, and some have bright bands of color on the wings. All species have well-developed hind legs and can jump rapidly into flight when disturbed. Nymphs are similar to adults, but paler in color and wingless; they hop rapidly when disturbed.

Crime Prevention

- ✿ Maintain healthy plants, which will recover quickly from leafhopper attacks.
- ✿ Attract and conserve natural enemies—damselflies, lacewings, lady beetles, minute pirate bugs, parasitic flies, parasitic wasps, and spiders.

Sentence

- ✿ Wash leafhopper nymphs from plants with a strong spray of water.
- ✿ Apply dormant oil sprays to kill adults overwintering on fruit trees.
- ✿ To control nymphs, spray with insecticidal soap or pyrethrins while nymphs are still small.

Leafminer

Since you won't normally see leafminers, you need to watch for their damage: Their tunnels are the tip-off that larvae are in your plants' leaves.

Last Seen in the Vicinity of . . .
North America.

Crime

Larvae tunnel through the leaf tissue, making hollowed-out, curved, or winding mines, each type characteristic of a particular species. They attack many vegetable crops, trees, and flowers, including beets, cabbage, chard, ivy, lettuce, peas, peppers, spinach, tomatoes, chrysanthemums, and nasturtiums. Larval damage may destroy seedlings; on older plants, leafminers are often a nuisance rather than a serious problem. Mines are unsightly on ornamentals.

Description

Adults are black or black-and-yellow flies, $\frac{1}{10}$ inch long. Larvae are pale green, stubby, translucent maggots, $\frac{1}{8}$ inch long, found in tunnels in leaves. Eggs are white and cylindrical, laid side by side in clusters on undersides of leaves.

Crime Prevention

- ✿ Cover seedlings with floating row covers to prevent adults from laying eggs. Maintain covers all season on small plants such as beets and chard on which leafminers are numerous.
- ✿ Attract native parasitic wasps by planting nectar plants.
- ✿ Remove nearby dock or lamb's-quarters, which are wild hosts for beet leafminers.

Sentence

- ✿ Destroy mined leaves and remove egg clusters.
- ✿ Spray with neem extract.



BUG SHOT



BAD BUG

Mealybug

Female mealybugs are probably the ones you notice in your greenhouse: Males are very tiny insects that are rarely seen.

Last Seen in the Vicinity of . . .

The warmer, southern areas of North America and in greenhouses in the North.

Crime

Both adult mealybugs and nymphs suck plant juices from all parts of plants, particularly new growth. As a result, leaves wither and turn yellow, and fruit drops prematurely. These pests excrete honeydew on leaves as they feed, and this supports the growth of sooty molds. Mealybugs feed on citrus and other fruit trees, as well as avocados, grapes, and potatoes. They are major pests of flowers, flowering trees, ornamentals, and tropical foliage plants, including arums, oleanders, and poinsettias.

Description

Adult female mealybugs have soft, oval, pinkish bodies, $\frac{1}{10}$ inch long, covered with white, powdery or waxy fluff. The males are two-winged insects that are so tiny they are rarely seen. Nymphs are similar to females in appearance, but much smaller.

Crime Prevention

- ✿ Attract native parasitic wasps, which often keep populations in check outdoors.

Sentence

- ✿ Rinse plants with a strong stream of water to dislodge mealybugs.
- ✿ Spray with insecticidal soap.
- ✿ Spray summer oil on plants that tolerate oil sprays.

- ❖ Release mealybug destroyers on citrus and grapes outdoors and on greenhouse plants.
- ❖ For citrus mealybugs, release parasitic wasp *Leptomastix dactylopii*.

Mealybug Destroyer

You'll need to look closely to identify your mealybug destroyer friends: The hairy white larvae closely resemble their prey.

Patrol Route

Mealybug destroyers are native to California and the western coastal region of the United States; they're also sold commercially.

Good Deed

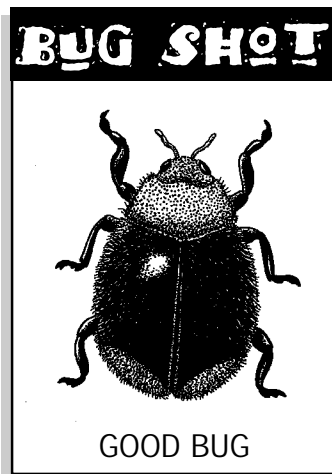
Both adults and larvae prey on aboveground species of mealybugs found on citrus, grapes, greenhouse ornamentals, and houseplants.

Description

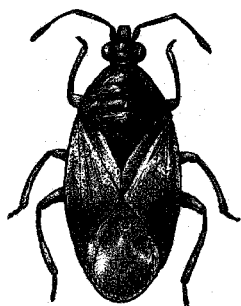
Adults are oval lady beetles, $\frac{1}{3}$ inch long, with black wing covers; the head and the tip of the abdomen are coral colored. Larvae are cream colored, segmented, and covered with long, waxy hair; they resemble mealybugs. Eggs are yellow ovals.

Getting Them on Your Side

- ❖ Conserve native populations in your garden by avoiding the use of pesticides.
- ❖ Release 250 to 500 in small orchards or vineyards; release 2 to 5 per infested plant in interior plantings, twice yearly; on houseplants, confine 10 to 20 adults on each plant for 4 to 5 weeks by draping sheer curtain material over the plant and tying it around the pot.



BUG SHOT



GOOD BUG

Minute Pirate Bug

Minute pirate bugs are the kind of guests you want at holiday dinners: They will attack almost any insect, but they commonly feed on thrips, spider mites, and small caterpillars.

Patrol Route

Minute pirate bugs are found throughout North America; some species are also sold commercially.

Good Deed

All stages of pirate bugs are voracious predators of thrips, spider mites, small caterpillars, leafhopper nymphs, other small insects, and insect eggs. They are adept at finding prey deep inside flowers and are particularly good predators of thrips. Adults also feed on pollen.

Description

Adults are quick-moving, black-and-white-patterned bugs, $\frac{1}{4}$ inch long, with wings folded flat over the abdomen. Nymphs are shiny, oval, and up to $\frac{1}{2}$ inch long. They are wingless until the final molt to adults; their color changes from yellow to orange to mahogany brown as they grow.

Getting Them on Your Side

- ✿ Plant pollen and nectar plants, especially goldenrod, daisies, yarrow, and alfalfa.
- ✿ Collect pirate bugs on goldenrod in fall and move them to the garden.
- ✿ In greenhouses, release purchased or wild-collected pirate bugs at the rate of one adult per one to five plants.

Mite, Predatory

Predatory mites may look like pest mites, but take a closer look: Up close you'll see that the predators move faster and have fewer hairs.

Patrol Route

Predatory mites are found throughout North America; several species are also sold commercially.

Good Deed

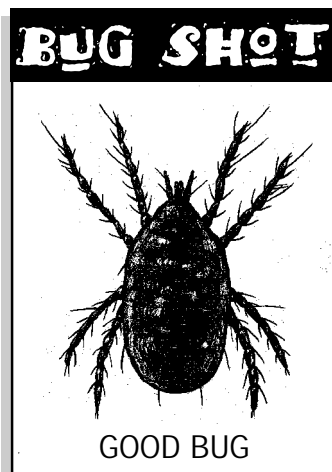
Predatory mites attack spider mites, especially European red mites and citrus red mites. Some also feed on pollen, thrips, or other types of mites.

Description

Adults are minute, beige to reddish tan, fast-moving mites, $\frac{1}{50}$ inch long. Nymphs are similar to adults, but smaller and lighter in color.

Getting Them on Your Side

- ✿ Avoid pesticide use.
- ✿ Sustain native species by sprinkling pollen (especially from ice plants, cattails, or dandelions) on plants.
- ✿ For apples and strawberries, release *Metaseiulus occidentalis* to control European red mites and other spider mites.
- ✿ In greenhouses, release *Phytoseiulus persimilis* or other species to control spider mites (except on tomatoes).
- ✿ Release *Amblyseius cucumeris* to control small thrips on peppers and cucumbers.



BUG SHOT



BAD BUG

Mite, Spider

It's easy to spot spider mite damage: Most species spin fine webs on leaves and shoots.

Last Seen in the Vicinity of . . .

North America.

Crime

Both adults and nymphs pierce plant cells and suck the juice from the undersides of leaves. Their feeding weakens plants, causes leaves to drop, and results in stunted fruit. Early dam-

age appears as yellow speckled areas on leaves; extremely fine webbing may be visible on undersides of leaves. In severe infestations, leaves become bronzed or turn yellow or white with brown edges. Webs may cover both sides of the leaves and eventually encase growing tips; long strings of webbing bearing hundreds of mites may hang down from the branch tips and disperse on the wind. Spider mite outbreaks can be sudden and severe in hot, dry conditions; in low humidity, the mites feed more to avoid drying up, which leads them to lay more eggs and speeds their development.

Various species attack vegetables, including beans, cucumbers, eggplants, melons, peppers, squash, and tomatoes. They also feed on ornamental trees, fruit trees, berries, herbs, annuals, perennials, shrubs, vines, and houseplants.

Description

All stages of spider mites are minute and less than $\frac{1}{50}$ inch long. The adults have eight legs, while the youngest nymphs have six legs. They are reddish, pale green, or yellow and have fine hairs on each side. The eggs are minuscule, pearly spheres found on webbing or on leaf hairs.

Crime Prevention

- ☼ Maintain high humidity in greenhouse crops and around houseplants.

- ☼ Preserve native predatory mites in orchards by avoiding the use of pesticides.

Sentence

- ☼ Spray dormant oil on fruit trees to kill overwintering spider mite eggs.
- ☼ Release predatory mites *Metaseiulus occidentalis* or *Typhlodromus pyron* on fruit trees, and *Phytoseiulus persimilis* or similar species on vegetables, strawberries, flowers, and houseplants. Consult suppliers for best species and release rates for local conditions.
- ☼ Spray summer oil on woody shrubs and trees that can tolerate it.
- ☼ As a last resort, spray insecticidal soap, neem extract, or pyrethrins.

Nematode

Nematodes can be harmful or beneficial: Some parasitize soil-dwelling pests; other species cause lesions on roots and leaves.

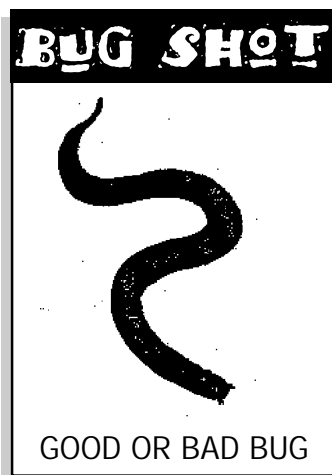
Last Seen in the Vicinity of . . .
North America.

Crime

Pest nematodes cause root knots or galls, injured root tips, excessive root branching, leaf galls, lesions of dying tissue, and twisted, distorted leaves. Plants most commonly attacked at the roots include corn, lettuce, peppers, potatoes, tomatoes, and other vegetables; plants that sustain leaf and stem injury include alfalfa, chrysanthemums, onions, and rye.

Good Deed

Some parasitic nematode species are sold as biological controls for root weevils, crown and stem borers, corn



rootworms, and other lawn and garden pests. Beneficial nematodes also decompose organic materials and are common in compost heaps.

Description

Nematodes are slender, translucent, unsegmented worms. Most species are microscopic plant parasites only about $\frac{1}{50}$ inch long. Species that parasitize insects are larger—anywhere from $\frac{1}{25}$ inch to several inches long. Beneficial, soil-dwelling species that break down organic matter are easily visible—about $\frac{1}{4}$ inch long.

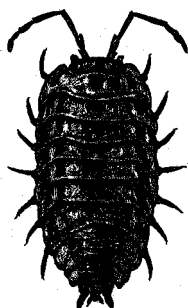
Crime Prevention

- ☼ Control pest nematodes by crop rotation with nonsusceptible crops.
- ☼ Plant a nematode-suppressing cover crop, such as marigolds.

Sentence

- ☼ Solarize soil with clear plastic mulch for the summer months; this procedure heats soil sufficiently to kill pest nematodes.

BUG SHOT



BAD BUG

Pillbug/Sowbug

Don't let your seedlings fall victim to pillbugs: They'll chew on leaves and fine roots.

Last Seen in the Vicinity of . . .
North America.

Crime

Pillbugs (also called sowbugs) generally feed on decaying organic matter in the soil. They cause little or no damage to established plants, but if their num-

bers become high, they can severely damage seedlings by

chewing on the tender leaves and fine roots. They attack the seedlings of many types of plants.

Description

Adults are gray or brown crustaceans, $\frac{1}{4}$ to $\frac{5}{8}$ inch long, with numerous segments of jointed armor. They have seven pairs of barely visible, short legs. Pillbugs curl up into a ball when disturbed. The nymphs look like small adults.

Crime Prevention

- ☛ Drain wet areas and remove trash, leaf litter, boards, and other such material from around foundations and garden beds to remove hiding places.
- ☛ To protect seedlings, allow the soil surface to dry out between waterings, or sprinkle diatomaceous earth around attacked seedlings.

Sentence

- ☛ Check for pillbugs under stones or boards every morning and destroy them.
- ☛ Set out traps made from heavy paper painted with sticky glue, then folded tentlike, with the sticky side down.

Praying Mantis

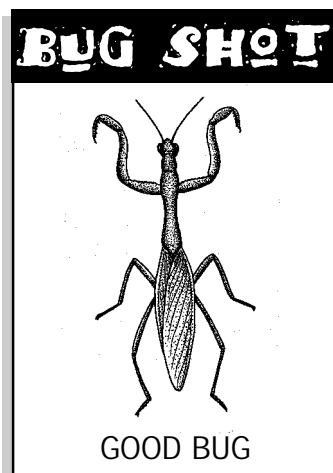
If praying mantids look as if they're poised for attack, they are: Let them take care of your pest problems.

Patrol Route

Praying mantids are found in the southern and eastern United States and north into Ontario, Canada.

Good Deed

Mantids hunt down and devour both pest insects and beneficial species. They eat virtually any insect they



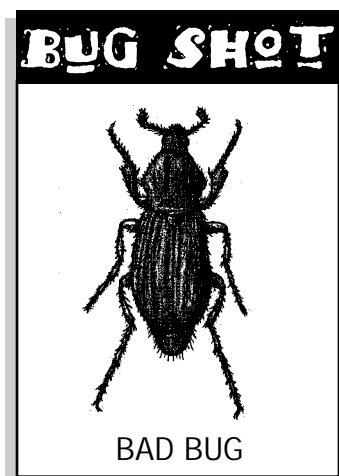
catch, including each other. Nonetheless, praying mantids are an asset to the garden.

Description

Adults are very large, green or brown, streamlined insects, 2 to 3 inches long, with long legs and prominent eyes in a triangular head. The large forelegs bear rows of sharp spines and are held up in readiness to capture prey. Wings are folded flat on top of the abdomen. Nymphs are similar to adults, but smaller and wingless. Eggs are laid in a grayish, frothy case of 50 to 400 eggs glued to stems or twigs.

Getting Them on Your Side

- ✿ To protect native praying mantis species, don't release purchased mantids.
- ✿ Avoid using pesticides.
- ✿ Provide sites for overwintering eggs by keeping permanent plantings around the garden.



Rose Chafer

Don't let your population of rose chafers grow: In numbers, they can do serious damage.

Last Seen in the Vicinity of . . .
North America.

Crime

Adults chew on flowers, leaves, and fruits, but are usually damaging only when exceptionally numerous. When this happens, they can cause serious harm to developing grapes, ripening cherries, and buds of roses. Destruction is more severe in areas with sandy soils. Adults also may attack strawberries, dahlias, irises, hollyhocks, peonies, and vegetables. The larvae feed on roots of grass and weeds, doing little noticeable damage.

Description

Adults are reddish brown beetles, $\frac{1}{8}$ inch long, with wing covers bearing small, yellowish hairs; the body is black on the underside. Larvae are small white grubs found in the soil.

Crime Prevention

- ☼ Where infestations are severe, protect small plants with floating row covers until July to prevent adults from laying eggs.

Sentence

- ☼ Cultivate soil until early June to eliminate pupae.
- ☼ If large numbers of chafers are present, spray pyrethrins as a last resort.

Rove Beetle

Rove beetles may be funny-looking, but they're your friends in the garden: The beneficial decomposers often hold the tip of their abdomen bent upward, as if preparing to sting.

Patrol Route

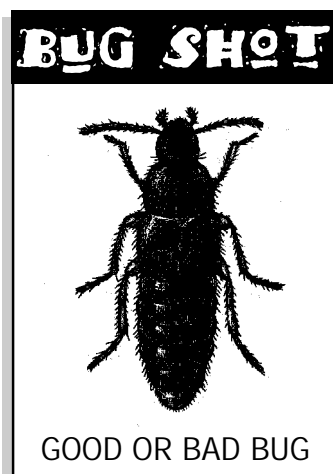
More than 1,300 species are native to North America.

Good Deed

Most species scavenge decaying organic materials and are beneficial decomposers in the ecosystem. Many species are predators of aphids, fly eggs, maggots, mites, nematodes, slugs, snails, and springtails, making the rove beetle a valuable ally in the garden. A few species parasitize cabbage maggots and other fly larvae.

Description

Adults are slender, elongated, quick-moving insects, $\frac{1}{10}$ to 1 inch long, with stubby wing covers extending only over the



first three segments on the abdomen. They are usually brown or black; some are shiny, others have dense hairs, and a few species have bright markings. Most are active at night. Larvae resemble adults but are wingless.

Getting Them on Your Side

- ✿ Maintain permanent beds and plantings in your garden to protect overwintering adults.
- ✿ Interplant with cover crops or mulch planting beds.
- ✿ Make stone or plank walks in the garden to provide shelter.



Scale, Soft

Soft scales easily multiply your pest problems: Females of some species lay as many as 2,000 eggs, while others give birth to several nymphs per day.

Last Seen in the Vicinity of . . .
North America.

Crime

All stages of scales suck plant sap, weakening plants and causing leaves to turn yellow and drop. In severe infestations, plants may die. Soft scales also secrete large quantities of sticky honeydew onto leaves and fruit, which encourages sooty molds. Soft scales attack citrus and other fruits, ornamental shrubs, trees, and houseplants.

Description

Adult females are oval or round, legless, wingless bumps, $\frac{1}{10}$ to $\frac{1}{2}$ inch long. Adult males are minute, yellow-winged insects. The youngest larvae are tiny crawlers resembling minute mealybugs, while older larvae settle and become sedentary.

Crime Prevention

- ✿ Attract native parasitic wasps and predatory beetles with nectar and pollen plants.

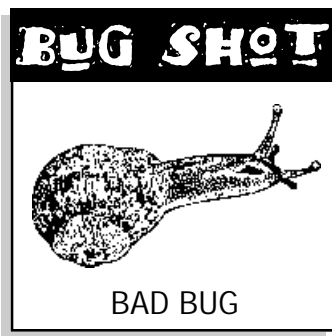
Sentence

- ✿ Prune and destroy infested branches and twigs.
- ✿ Wash scales from plants with a soft brush or cloth dipped in an insecticidal soap solution, then rinse well.
- ✿ Dormant oil sprays on fruit and ornamental trees provide good control. Summer oil may also be used on plants that tolerate it (do not use on citrus after July).
- ✿ To experiment with biological control, release predatory beetles (*Chilocorus nigritus* or *Lindorus lophantha*). These can eliminate scales on houseplants if fine mesh cloth is used to confine them to the plants.
- ✿ For soft brown scales, experiment with biological control by releasing the parasitic wasp *Metaphycus helvolus*.

Slug, Snail

Slugs and snails leave more evidence than just large holes in leaves: Slime trails let you know you're dealing with these garden pests.

Last Seen in the Vicinity of . . .
North America.



Crime

Both slugs and snails feed primarily on decaying plant material. They also eat soft, tender plant tissue and rasp large holes in foliage, stems, and even bulbs. They may completely demolish seedlings and severely damage young shoots and plants. They may crawl up trees and shrubs to feed. Slugs and snails are most numerous and damaging in wet years and high-rainfall regions. They attack any tender plants.

Description

Snails carry coiled shells on their backs, while slugs have no shells. Common species of slugs and snails are $\frac{1}{8}$ to 1 inch long. Slugs and snails are gray, tan, green, or black, and some have darker spots or patterns. The eggs are clear, oval

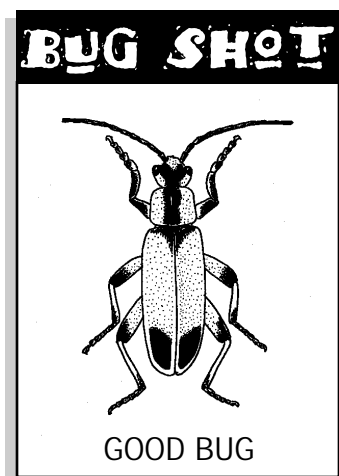
or round, and laid in jellylike masses under stones or debris in the garden.

Crime Prevention

- ✿ Repel slugs and snails with copper strips fastened around trunks of trees or shrubs, or edge garden beds with copper flashing or screening, first making sure all slugs are removed from the enclosed area.
- ✿ Wrap commercial snail and slug tapes around tree trunks.
- ✿ Maintain permanent walkways of clover, sod, or stone mulches to harbor ground beetles and garter snakes, natural enemies of slugs.
- ✿ Where slugs are an occasional problem, spread wide bands of cinders, wood ashes, or diatomaceous earth along rows to protect seedlings (renew the materials frequently).

Sentence

- ✿ Set out traps such as pots, boards, or grapefruit rinds; check them every morning and destroy the slugs.
- ✿ Trap slugs and snails in shallow pans of beer buried with the container lip flush with the soil surface.



Soldier Beetle

Soldier beetles guard your garden: They frequently linger around flowers, feeding on nectar, pollen, and small insects such as aphids.

Patrol Route

Soldier beetles are found throughout North America.

Good Deed

Larvae and adults eat aphids, beetle larvae, caterpillars, corn rootworms, cucumber beetles, and grasshopper eggs.

Description

Adults are elongated, slender, nearly flat beetles, $\frac{1}{8}$ to $\frac{1}{2}$ inch long, often with downy, leathery wing covers. Adults are mostly dark gray, brown, or yellow; some body parts—such as the thorax or legs—may be red, orange, or bright yellow. Larvae are flattened, elongated, covered with velvety hairs, and usually dark colored.

Getting Them on Your Side

- ✿ To attract adult soldier beetles, plant goldenrod, milkweed, wild parsley, hydrangeas, or catnip.
- ✿ To protect pupating beetles, maintain some permanent plantings where soil is not disturbed.

Spined Soldier Bug

Spined soldier bugs resemble pesky stinkbugs, but there's an easy way to tell the difference: Look for the long, pointed "shoulders" to identify this beneficial.

Patrol Route

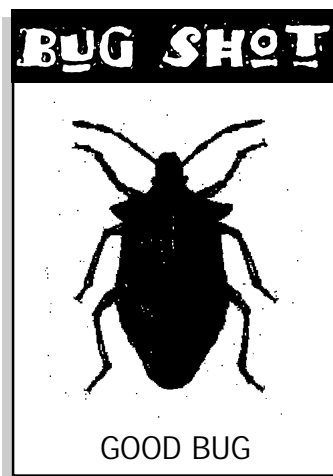
Spined soldier bugs are native to North America; they're also sold commercially.

Good Deed

Both adult spined soldier bugs and nymphs feed on many species of hairless caterpillars, including cabbage loopers, fall armyworms, imported cabbageworms, sawfly larvae, and tent caterpillars. They also feed on beetle larvae, particularly those of the Colorado potato beetle and Mexican bean beetle.

Description

Adults are shield-shaped bugs, $\frac{1}{2}$ inch long, grayish brown, and covered with black flecks; they have sharp, pointed



“shoulders” on the sides of their thoraxes. Nymphs are oval and similar to adults but wingless. Eggs are metallic bronze and barrel-shaped.

Getting Them on Your Side

- ✿ Maintain permanent beds of perennials to provide shelter for these beneficials.
- ✿ Try releases of two to five bugs per square yard of beans to control bean beetles. In the potato patch, release the bugs as the plants are sprouting to control potato beetle larvae.



Spittlebug/ Froghopper

Spittlebugs leave their signature on the plants they attack: Frothy “spittle” deposited on stems identifies these insects.

Last Seen in the Vicinity of . . .
North America.

Crime

Both adults and nymphs suck plant juices of strawberries, legumes, forage crops, and nursery plants, causing stunted, dwarfed, weakened plants with reduced yields in rare cases. Adults may migrate in large numbers from hay fields to nearby crops when the hay is cut. When this happens, neighboring gardens may suddenly be infested with them.

Description

Adults are stout, oval, frog-faced, mottled brown or black bugs, $\frac{1}{4}$ to $\frac{1}{2}$ inch long, with sharp spines on their hind legs. Nymphs are yellow to yellowish green, similar to adults, but wingless. They live inside a foamy mass of “spittle” on the stems of plants. Eggs are white to beige, laid in rows on stems or stubble.

Crime Prevention

- ❖ Conserve native predatory bugs, such as damsel bugs and pirate bugs, by avoiding the use of pesticides.
- ❖ Cover susceptible plants with floating row covers before nearby hay fields are cut.

Sentence

- ❖ Wash the nymphs and spittle masses off of plants with a strong stream of water.
- ❖ If high numbers of nymphs were seen in summer, plow down the stubble of susceptible crops in the fall to kill overwintering eggs.

Squash Vine Borer

If entire vines wilt suddenly, check for squash vine borers: They tunnel into the bases of vine stems.

Last Seen in the Vicinity of . . .

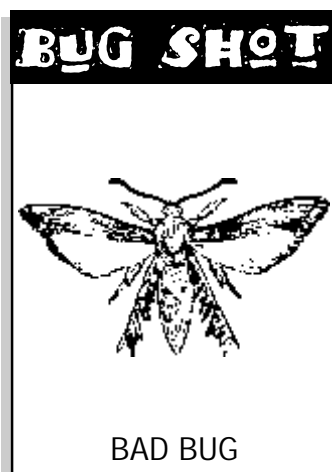
The United States and Canada east of the Rocky Mountains and south to Mexico.

Crime

Larvae bore into the vines of cucumbers, gourds, melons, pumpkins, and squash, chewing the inner tissue near the base and filling the stem with moist, slimy castings. The attacked vines wilt suddenly, and girdled vines rot and die. Larvae may also feed on fruit later in the season.

Description

Adults are narrow-winged moths with wingspans of 1 to 1½ inches. They have olive-brown forewings, clear hind wings, and a red abdomen with black rings. There are long, reddish fringes on the hind legs. Larvae are white grubs up to 1 inch long, with a brown head.



Crime Prevention

- ✿ Plant early and promote vigorous growth so vines are able to tolerate attacks.
- ✿ Protect young vines with floating row covers; uncover them later to allow pollinators to reach them or hand-pollinate.

Sentence

- ✿ Repeatedly spray the base of plants with pyrethrins to kill larvae before they enter vines.

BUG SHOT



BAD BUG

Stinkbug

There's no mistaking this garden pest: Stinkbugs emit a foul smell when disturbed.

Last Seen in the Vicinity of . . .
North America.

Crime

Both adult stinkbugs and nymphs suck sap from leaves, flowers, fruit, and seeds of cabbage-family crops, beans, corn, peaches, peas, squash, and tomatoes. Affected leaves may wilt and turn brown or have brown spots. Feeding punctures in fruit cause scarring, yellow or whitish patches under the skin, and dimpling known as "catfacing." Legume pods drop or have deformed seeds. Stinkbugs tend to become pests as nearby weedy areas dry out during the summer, driving them into the garden.

Description

Adults are shield-shaped, green, tan, brown, or gray insects, $\frac{1}{2}$ to $\frac{5}{8}$ inch long. One species has bright red and black harlequin markings. Nymphs are oval and similar to adults, but wingless. Eggs are barrel-shaped, laid in clusters on undersides of leaves.

Crime Prevention

- ✿ Remove or mow weeds around the garden to reduce overwintering sites.
- ✿ Remove crop residues and till the garden in the fall.
- ✿ Attract native parasitic wasps and tachinid flies with pollen and nectar plants.

Sentence

- ✿ Handpick all stages and crush egg masses on undersides of leaves or shake plants over a tray of soapy water.
- ✿ Spray insecticidal soap to control nymphs.

Tachinid Fly

They may look like houseflies, but look again: Tachinid flies are far from pests.

Patrol Route

Tachinid flies are found throughout North America.

Good Deed

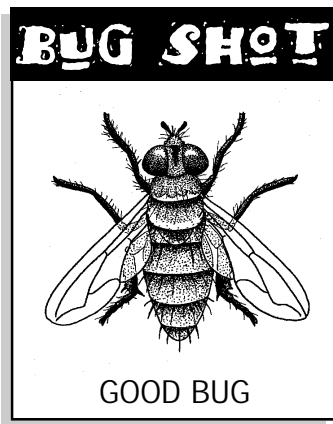
Among this group of beneficial flies are the most important natural enemies of many caterpillars, including armyworms, cabbage loopers, codling moths, cutworms, pest nematodes, gypsy moth larvae, hornworms, and tent caterpillars. Some also attack grasshoppers, sawflies, squash bugs, and stinkbugs.

Description

Adults are robust, gray, brown, or black, $\frac{1}{3}$ - to $\frac{1}{2}$ -inch-long insects resembling overgrown, bristly houseflies. Larvae are white maggots that feed inside host insects.

Getting Them on Your Side

- ✿ Plant dill, parsley, sweet clover, and other herbs to attract adults.



- ✿ Allow a few weeds, such as wild carrot and yarrow, to flower in the garden.
- ✿ Don't destroy caterpillars with white eggs stuck to their backs—these will develop into more tachinid flies.

BUG SHOT



BAD BUG

Tarnished Plant Bug

Watch out for tarnished plant bugs: The yellow-green nymphs are especially damaging.

Last Seen in the Vicinity of . . .
North America.

Crime

Both adults and nymphs pierce leaves, buds, and fruits and suck plant juices; nymphs are most damaging. Their toxic saliva causes buds and pods to

drop and distorts leaves and shoots. Plants wilt or are stunted, and branch tips blacken and die back. Feeding on fruit causes pitted, “catfaced” fruit, while broccoli and cauliflower show dead spots on the florets. Tarnished plant bugs feed on a wide variety of plants, including most flowers, fruits, many vegetables, and weeds.

Description

Adults are quick-moving, oval bugs, ¼ inch long. They are a mottled light green to coppery brown in color, and their top wings have a black-tipped yellow triangle on each side. From the side, there is a characteristic downward slant to the rear half of the wings. Nymphs are yellowish green and similar to adults, but wingless. Eggs are inserted into stems or leaves.

Crime Prevention

- ✿ Keep weeds and crop debris down around gardens.
- ✿ Cover small plants with floating row covers.

- ☼ Attract predatory big-eyed bugs, damsel bugs, and minute pirate bugs with nectar and pollen plants.

Sentence

- ☼ Spray pyrethrins to control nymphs and adults.
- ☼ Spray summer oils on plants that tolerate them.

Thrip

Get out your magnifying glass to identify these pests: Thrips are so small that individual insects are almost invisible.

Last Seen in the Vicinity of . . .
North America.

Crime

Both adults and nymphs suck the contents of plant cells, leaving silvery speckling or streaks on leaves. Severe infestations stunt and distort plants, damage flowers, and scar developing fruit. Some species spread tomato spotted wilt virus. Various species attack asparagus, cabbage, lettuce, onions, peas, flowers, privet, and fruit and shade trees.

Description

Adults are minute, elongated insects, $\frac{1}{50}$ to $\frac{1}{25}$ inch long. They are yellowish, brown, or black and have narrow, fringed wings. They move quickly and like to hide in tight crevices in plant stems and flowers. The nymphs are light green or yellow, similar to adults, but smaller.

Crime Prevention

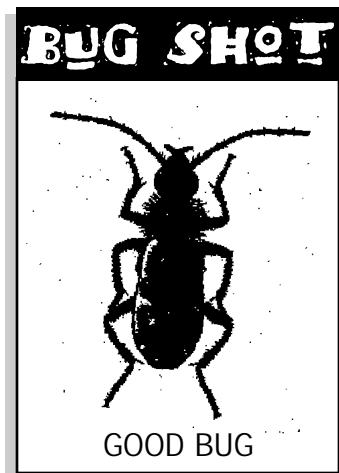
- ☼ Attract native predators such as lacewings, lady beetles, and minute pirate bugs.

Sentence

- ☼ Spray dormant oil on fruit trees.



- ✿ In greenhouses, for onion or western flower thrips, release the predatory mite *Amblyseius cucumerisor* minute pirate bugs.
- ✿ Use blue or yellow sticky traps to catch adults in greenhouses.
- ✿ Spray insecticidal soap, pyrethrins, or neem extract.
- ✿ As a last resort, dust undersides of leaves with diatomaceous earth.



Tiger Beetle

Don't let your insect light traps zap these bugs: Tiger beetles prey on a wide variety of pests.

Patrol Route

Tiger beetles are found throughout North America.

Good Deed

Both adults and larvae feed on a variety of insects. Beetles capture their prey by running them down; larvae dig into burrows in the soil and wait there to seize passing insects, which they drag into the burrow to eat. Although they feed on some desirable species, tiger beetles are generally considered beneficial.

Description

Adults are long-legged beetles, $\frac{1}{2}$ to $\frac{3}{4}$ inch long, with bright colors and patterns on their bodies. They are often attracted to lights at night. Larvae are segmented and S-shaped, with a pronounced hump in their back, which has strong hooks to anchor them into burrows in the soil.

Getting Them on Your Side

- ✿ Maintain permanent plantings as refuge.
- ✿ Do not leave outdoor lights on all night in summer.

- ☼ To keep from killing tiger beetles along with pests, do not use insect light traps.

Tomato Hornworm

Look carefully for these caterpillars that blend in very well with foliage: Tomato hornworms can do serious damage to leaves.

Last Seen in the Vicinity of . . .
North America.



Crime

Tomato hornworm larvae chew large holes in leaves and may completely strip young plants. In severe infestations, larvae also feed on stems and chew large holes in fruit. In addition to tomatoes, hornworms feed on eggplant, peppers, potatoes, and tobacco.

Description

Adults are mottled gray, narrow-winged moths with 4- to 5-inch wingspans and rows of orange dots along their plump, furry abdomens. Larvae are green, up to 4½ inches long, with a single large horn on the tail and eight diagonal white marks along the sides. Eggs are round, yellowish green, and laid singly on the undersides of leaves.

Crime Prevention

- ☼ Grow nectar or pollen plants to attract native parasitic wasps, which usually provide sufficient control of hornworms in most areas.

Sentence

- ☼ Handpick caterpillars from foliage and destroy.
- ☼ Spray *Bacillus thuringiensis* var. *kurstaki* (BTK) or neem extract while caterpillars are still small.
- ☼ Till the garden in fall or early spring to destroy pupae.

BUG SHOT



BAD BUG

Webworm, Garden

When trying to catch garden webworms in the act, be careful: When disturbed, they quickly drop from plants on silk threads.

Last Seen in the Vicinity of . . .

North America.

Crime

Larvae spin silk webbing around leaves and skeletonize foliage. When populations are high, the caterpillars cover plants with webs and can cause severe defoliation. Garden webworms feed on strawberries and most vegetables, especially beans and peas, as well as some weeds and field crops.

Description

Adults are brown moths with $\frac{3}{4}$ -inch wingspans and yellowish and gray marks on the wings. Garden webworm larvae are pale green to nearly black caterpillars, up to $\frac{3}{4}$ inch long. They have a darker or lighter stripe down the back and three black spots on each segment. The eggs are laid in masses of 5 to 50.

Crime Prevention

- ✿ Grow nectar and pollen plants to attract native parasitic wasps, which usually do a good job of suppressing webworm numbers.

Sentence

- ✿ Pick caterpillars from plants and drop into a pail of soapy water; destroy webbing.
- ✿ Spray *Bacillus thuringiensis* var. *kurstaki* (BTK), neem extract, or pyrethrins on leaves when larvae are small, before webbing protects them from sprays.
- ✿ In fall, till the garden to kill pupae.

Whitefly

It's easy to identify whiteflies: They congregate on the undersides of leaves and fly up in a cloud of white when disturbed.

Last Seen in the Vicinity of . . .

Greenhouses throughout North America; they're also found outdoors in warm regions of Florida, the Gulf states, and the West Coast.



Crime

Both nymphs and adults suck plant juices, weakening plants. They can spread plant viruses through their feeding. They also exude honeydew, which supports the growth of sooty mold on leaves and fruit. The adults tend to be found on the top parts of plants, while nymphs are lower down. The most damaging whitefly species attack citrus, ornamentals, annuals, azaleas, rhododendrons, grapes, and vegetables, especially squash- and tomato-family plants outdoors and in greenhouses.

Description

Adults are tiny, powdery-white insects, $\frac{1}{25}$ inch long. Nymphs are tiny, flattened, legless, translucent scales, $\frac{1}{30}$ inch long, found mostly on undersides of leaves. Eggs are gray or yellow cones the size of a pinpoint.

Crime Prevention

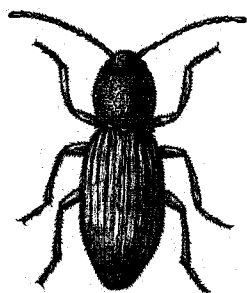
Attract lacewings, lady beetles, native parasitic wasps, and pirate bugs.

Sentence

- ☛ Capture adults on yellow sticky traps.
- ☛ For a few plants, use a handheld vacuum to remove adults from undersides of leaves.
- ☛ In greenhouses, release *Encarsia formosa* wasps.

- ❁ To control nymphs of various species, spray neem extract, insecticidal soap, kinoprene (Enstar), or summer oil on plants that can tolerate oil sprays.
- ❁ As a last resort, spray pyrethrins.

BUG SHOT



BAD BUG

Wireworm

Listen carefully to identify wireworms: Often called click beetles, adults make a clicking sound as they flip from their backs onto their feet.

Last Seen in the Vicinity of . . .
North America.

Crime

Adults feed on leaves and flowers but cause little damage. It is the larvae boring into seeds, roots, and crowns that are most damaging. Plants may be stunted or killed, and boring in tubers and bulbs ruins them and allows rot to enter. Wireworms are worst in newly turned sod and for a few years thereafter. They attack most vegetables, particularly potatoes, carrots, and corn, as well as gladiolus, lobelias, and other corms.

Description

Adults are elongated brown or black beetles, $\frac{1}{3}$ to $\frac{3}{4}$ inch long. They have fine, lengthwise grooves on the wing covers. Larvae are shiny, brown, leathery, jointed, and wormlike, growing up to $1\frac{1}{2}$ inches long.

Crime Prevention

- ❁ Delay planting tubers and corms until the soil is very warm, and keep the soil bare until planting time.

Sentence

- ❁ To expose wireworm larvae to birds, cultivate the soil for new gardens weekly for 4 to 6 weeks in the fall, or allow

chickens to run on infested ground.

- ☼ Raw potato or carrot pieces buried several inches deep in the soil attract some species; check these traps every few days and destroy wireworms.
- ☼ Applying insect parasitic nematodes to the soil may help control larvae.

Yellow Jacket

Yellow jackets may be the bane of picnickers everywhere, but it's time to see them in a new light: These creatures help control garden pests.

Patrol Route

Yellow jackets are found throughout North America.

Good Deed

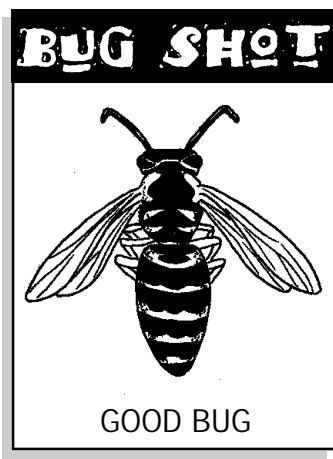
Yellow jackets dive into foliage and carry off flies, caterpillars, and other pests to feed to their brood. Adults generally feed on sugary solutions, such as flower nectar or juices of ripe fruit.

Description

Adults are ½ to ¾ inch long, with a shiny, yellow-and-black-striped abdomen and two pairs of transparent wings. Larvae are white grubs found inside cells in paper nests.

Getting Them on Your Side

- ☼ Plant nectar flowers.
- ☼ Don't destroy the gray paper nests of these insects unless they are in a place frequented by people or pets, or unless a family member is allergic to insect stings.
- ☼ To avoid conflict with yellow jackets, keep picnic food and drinks covered, maintain clean garbage cans, and pick fruit early in the morning.



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Once in a while everything in gardening comes together so beautifully that perfection is just a short step away.

—**Robert Rodale (1930–1990)**



*We inspire and enable people to improve their lives
and the world around them.*

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